

REMARKS

Claims 1-82 were examined. Claims 4, 9, 13, 23, 48 and 76 are amended. Claims 1-82 remain in the Application.

The Patent Office objects to claim 23 for an informality. The Patent Office rejects claims 4, 13, 48 and 76 under 35 U.S.C. §112, second paragraph. The Patent Office rejects claims 1-6 under 35 U.S.C. §102(e). The Patent Office rejects claims 1-6, 8-11, 14-15, 18-28, 30-32, 35, 38-44, 48-51, 55-59, 61-63, 66, and 69-79 under 35 U.S.C. §102(b). The Patent Office rejects claims 7, 12-13, 16-17, 29, 33-34, 36-37, 45, 47, 52-54, 60, 64-65, 67-68 and 80-82 under 35 U.S.C. §103(a). Reconsideration of the objection and the claim rejections is respectfully requested in view of the above amendments and the following remarks.

A. Objection to Claim 23

The Patent Office objects to claim 23 for an informality. Applicants amend claim 23 to address the concern raised by the Patent Office. Applicants respectfully request that the Patent Office withdraw the objection.

B. 35 U.S.C. §112, Second Paragraph: Rejection of Claims 4, 13, 48 & 76

The Patent Office rejects claims 4, 13, 48 and 76 under 35 U.S.C. §112, second paragraph, as indefinite. Applicants amend the noted claims to address the concerns raised by the Patent Office. Applicants believe at least the amendments to claims 4, 48 and 76 were not required for purposes of patentability, because the claims in their non-amended form meet the requirements of 35 U.S.C. §112, second paragraph. Claim 4, in its non-amended form, relates to the transformability of the material (with a transformable property) to a second volume. There is a proper basis for this material in claim 1. Similarly, claims 48 and 76, in their non-amended form, include interconnection elements coupled to a first substrate. Thus, there is proper basis for the language as presented.

Despite Applicants' belief that at least claims 4, 48 and 76 comply with 35 U.S.C. §112, second paragraph, in their non-amended form, Applicants amend the claims herein to comply with the Patent Office's request. Applicants respectfully request that the Patent Office withdraw the rejection to claims 4, 13, 48 and 76 under 35 U.S.C. §112, second paragraph.

C. 35 U.S.C. §103(e): Rejection of Claims 1-6

The Patent Office rejects claims 1-6 under 35 U.S.C. §102(e) as anticipated by U.S. Patent 6,150,186 issued to Chen et al. (Chen). Chen describes a method of fabricating a structure comprising providing a base part (e.g., first element material 204) depositing a material (e.g., second element material 206) on the base part. The deposited material comprises at least one metal and one

additive. In one example, the deposited material (coating 206) has an amorphous or nanocrystalline atomic configuration. Col. 6, lines 42-44. By heat-treating coating 206, preferably for a relatively short time, coating 206 undergoes a transformation from nanocrystalline or amorphous to crystalline or ordered. Col. 6, lines 50-53; Col. 10, lines 34-36. Referring to the Abstract of Chen, the heat treatment is a "moderate" heat treatment that differs from commonly employed "stress relief" heat treatments in using lower temperatures and/or shorter time, preferably, just enough to reorganize the material to the new, desired form.

Independent claim 1 is not anticipated by Chen, because Chen does not describe an interconnection element including a first element material and a second element material, when one of the materials comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. Chen speaks of modifying the atomic structure of coating 206, not the shape of the interconnection of element as a whole.

Claims 2-6 depend from claim 1 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 1, claims 2-6 are not anticipated by Chen. Applicants respectfully request that the Patent Office withdraw the rejection to claims 1-6 under 35 U.S.C. §102(e).

D. 35 U.S.C. §102(b): Rejection of Claims 1-6, 8-11, 14-15, 18-28, 30-32, 35, 38-44, 48-51, 55-59, 61-63, 66 & 69-79

The Patent Office rejects claims 1-6, 8-11, 14-15, 18-28, 30-32, 35, 38-44, 48-51, 55-59, 61-63, 66 and 69-79 under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,613,861 issued to Smith et al. (Smith). Smith describes spring contact 15 made of an elastic material, such as a chrome-molybdenum alloy or a nickel-zirconium alloy. Preferably, spring contact 15 is formed of an elastic conductive material, although it can also be formed of a non-conductive or semi-conductive material if they are coated or plated with a conductive material. See Smith, col. 4, lines 38-44. In one embodiment, Smith describes multiple sub-layers of one material and a final thickness of approximately one micron. Col. 6, lines 49-51. The final thickness is limited so as to achieve the desired spring shape with the spring contact having a compressive stress in upper portions and a tensile stress in lower portions. Col. 5, lines 11-15.

A stress gradient in the one material (of multiple sub-layers) of the spring contact of Smith allows it to bend up and away from the substrate. Col. 7, lines 64-66. The bending is accomplished by releasing a free portion (free portion 11) from the underlying substrate. Col. 7, lines 42-44. Such may be accomplished by under-cut etching of an insulating underlayer (col. 7, lines 42-44) or melting of a low-melting temperature underlayer (col. 7, line 67 through col. 8, line 3). Once the free portion is released, the spring contact can be annealed to relieve the stress in the anchor portion. Col. 8, lines 49-51. "This annealing process does not affect the free portion 11 because, once the

free portion is released and allowed to bend up, no stress remains on the free portion to be relieved by annealing. Thus, the free portion 11 remains curved up and away from the substrate 14 after annealing." Col. 8, lines 51-56. Finally, a layer of gold may be introduced over the spring contact. Col. 8, lines 57-62.

Independent claim 1 is not anticipated by Smith, because Smith does not disclose an interconnection element comprising a first element material and a second element material, wherein one of the first element material and the second element material comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. Smith describes a material having a stress gradient in the multiple sub-layers of the material. The stress gradient is responsible for the shape of the spring contact. The stress gradient remains in the material following the release of the free portion from the substrate although the material may change shape to account for the stress gradient. A property of the material does not change upon release from the substrate, rather the spring contact adopts a preferred shaped given the property of the material. As noted above the quoted sentences, thermally treating the spring contact, for example, does not affect the free portion of the spring contact.

Claims 2-6, 8-11, 14-15, and 18-21 depend from claim 1 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 1, claims 2-6, 8-11, 14-15 and 18-21 are not anticipated by Smith.

Independent claim 22 is not anticipated by Smith, because Smith does not describe an electronic component including, among other features, a plurality of free-standing interconnection elements coupled to a substrate, wherein an interconnection element includes a first element material and a second element material, at least one of which comprises a transformable property such that, upon transformation, a shape of the interconnection element is modified. Smith fails to disclose an interconnection element of a first element material and a second element material, one of which has a transformable property allowing the shape of the interconnection element to be modified.

Claims 23-28, 30-32, 35 and 38-44 depend from claim 22 and therefore contain all the limitations of that claim. For at least the reasons stated with claim 22, claims 23-28, 30-32, 35 and 38-44 are not anticipated by Smith.

Independent claim 48 relates to an assembly including, among other things, a first substrate having a plurality of interconnection elements, wherein an interconnection element includes a first element material and a second element material, at least one of which has a transformable property such that, upon transformation, a shape of the interconnection element is modified. Claim 48 is not anticipated by Smith, because Smith does not describe an interconnection element having a transformable property.

Claims 49-51, 55-59, 61-63, 66 and 69-75 depend from claim 48 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 48, claims 49-51, 55-59, 61-63, 66 and 69-75 are not anticipated by Smith.

Claim 76 relates to a system for contacting an electronic device including, among other things, a first substrate having a plurality of interconnection elements, wherein an interconnection element includes a first element material and a second element material, at least one of which comprises a transformable property such that, upon transformation, a shape of the interconnection element is modified. Claim 76 is not anticipated by Smith, because Smith fails to describe an interconnection element including a material having a transformable property.

Claims 77-79 depend from claim 76 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 76, claims 77-79 are not anticipated by Smith.

Applicants respectfully request that the Patent Office withdraw the rejection to claims 1-6, 8-11, 14-15, 18-28, 30-32, 35, 38-44, 48-51, 55-59, 61-63, 66, and 69-79 under 35 U.S.C. §102(b).

E. 35 U.S.C. §103(a): Rejection of Claims 7, 29, 34, 60 & 65

The Patent Office rejects claims 7, 29, 34, 60 and 65 under 35 U.S.C. §103(a) as obvious over Smith. According to the Patent Office, it would have been obvious to discover quantitative characteristics of the transformability volume and percent of spring material in the interconnection element.

Claim 7 depends from claim 1 and therefore contains all the limitations of that claim. Claim 7 is prima facie not obvious over Smith, because Smith fails to describe an interconnection element including a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, the shape of the interconnection element is modified. Further, there is no motivation from Smith to incorporate a material having a transformable property into a spring contact as Smith accomplishes its bending through the use of a stress gradient, not material transformation.

Claims 29 and 34 depend from claim 22 and therefore contains all the limitations of that claim. Claims 29 and 34 are prima facie not obvious over Smith, because Smith fails to describe an electronic component including a plurality of interconnection elements, wherein an interconnection element includes a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. There is likewise no motivation for an electronic component including interconnection element as described in claim 29. As noted above, Smith relies on a stress gradient in the material, rather than a transformable property.

Claims 60 and 65 depend from claim 48 and therefore contain all the limitations of that claim. Claims 60 and 65 are prima facie not obvious over Smith, because Smith fails to describe an

assembly including, among other things, a first substrate having a plurality of interconnection element, wherein an interconnection element comprises a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. Further, there is no motivation in Smith, as Smith relies upon a material having a stress gradient rather than a transformable property.

For the above stated reasons, Applicants respectfully request that the Patent Office withdraw the rejection to claims 7, 29, 34, 60 and 65 under 35 U.S.C. §103(a).

F. 35 U.S.C. §103(a): Rejection of Claims 12-13, 33 & 64

The Patent Office rejects claims 12-13, 33 and 64 under 35 U.S.C. §103(a) as obvious over Smith in view of U.S. Patent No. 5,832,601 issued to Eldridge et al. (Eldridge). Eldridge is cited for disclosing a first element material that may include palladium or its alloy.

Claims 12 and 13 depend from claim 1 and therefore contain all the limitations of that claim. Claims 12 and 13 are prima facie not obvious over the cited references, because the cited references fail to disclose an interconnection element having a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. Likewise, there is no motivation from the cited references, as Smith, the principal reference, teaches a material having a stress gradient rather than a transformable property.

Claim 33 depends from claim 22 and therefore contains all the limitations of that claim. Claim 33 is prima facie not obvious over the cited references, because the cited references fail to describe an electronic component including a plurality of interconnection elements, wherein an interconnection element includes a first element material and a second element material, at least one of which, comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. There is likewise no motivation for an electronic component including interconnection element as described in claim 33. As noted above, Smith, as the principal reference, relies on a stress gradient in the material, rather than a transformable property.

Claim 64 depends from claim 48 and therefore contains all the limitations of that claim. Claim 64 is prima facie not obvious over the cited references, because the cited references fail to describe an assembly including, among other things, a first substrate having a plurality of interconnection elements, wherein an interconnection element comprises a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified.

Further, there is no motivation in Smith, the principal reference, as Smith relies upon a material having a stress gradient rather than a transformable property.

For the above stated reasons, Applicants respectfully request that the Patent Office withdraw the rejection to claims 12-13, 33 and 64 under 35 U.S.C. §103(a).

G. 35 U.S.C. §103(a): Rejection of Claims 16-17, 37 & 68

The Patent Office rejections claims 16-17, 37 and 68 under 35 U.S.C. §103(a) as obvious over Smith in view of U.S. Patent No. 5,810,609 issued to Faraci et al. (Faraci). Faraci is cited for describing a second element material including a shape memory alloy.

Claims 16 and 17 depend from claim 1 and therefore contain all the limitations of that claim. Claims 16 and 17 are prima facie not obvious over the cited references, because the cited references fail to describe an interconnection element including a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, the shape of the interconnection element is modified. Further, there is no motivation from Smith to incorporate a material having a transformable property into a spring contact as Smith accomplishes its bending through the use of a stress gradient, not material transformation.

Claim 37 depends from claim 22 and therefore contains all the limitations of that claim. Claim 37 is prima facie not obvious over the cited references, because the cited references fail to describe an electronic component including a plurality of interconnection elements, wherein an interconnection element includes a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. There is likewise no motivation for an electronic component including interconnection elements as described in claim 37. As noted above, Smith, as the principal reference, relies on a stress gradient of the material to establish the shape of the spring contact, rather than a transformable property.

Claim 68 depends from claim 48 and therefore contains all the limitations of that claim. Claim 64 is prima facie not obvious over the cited references, because the cited references fail to describe an assembly including, among other things, a first substrate having a plurality of interconnection elements, wherein an interconnection element comprises a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. Further, there is no motivation in Smith, the principal reference, as Smith relies upon a material having a stress gradient property rather than a transformable property.

For the above stated reasons, Applicants respectfully request that the Patent Office withdraw the rejection to claims 16-17, 37 and 68 under 35 U.S.C. §103(a).

H. 35 U.S.C. §103(a): Rejection of Claims 34, 36, 47, 52-54, 65, 67 & 80-82

The Patent Office rejects claims 34, 36, 47, 52-54, 65, 67 and 80-82 under 35 U.S.C. §103(a) as obvious over Smith in view of U.S. Patent No. 5,772,451 issued to Dozier et al. (Dozier). Dozier is cited for disclosing coupling a spring material to the second element material (claims 34 and 65); releasably connecting an electronic assembly to an electronic component (claim 47); and second contact nodes comprising external connection points (claims 52 and 80); a third substrate and a plurality of third contact nodes (claims 53 and 81); and a stop structure (claims 54 and 82).

Claims 34, 36 and 47 depend from claim 22 and therefore contain all the limitations of that claim. Claims 34, 36 and 47 are prima facie not obvious over the cited references, because the cited references do not disclose an electronic component including a plurality of interconnection element, wherein an interconnection element includes a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. Likewise, there is no motivation from the cited references, as Smith, the primary reference, discloses utilizing a material having a stress gradient rather than a transformable property to define the shape of its spring contact.

Claims 52-54, 65 and 67 depend from claim 48 and therefore contain all the limitations of that claim. Claims 52-54, 65 and 67 are prima facie not obvious over the cited references, because the cited references fail to describe an assembly including, among other things, a first substrate having a plurality of interconnection elements, wherein an interconnection element comprises a first element material and a second element material, at least one of which comprises a material having a transformable property such that, upon transformation, a shape of the interconnection element is modified. Further, there is no motivation in Smith, the principal reference, as Smith relies upon a material having a stress gradient rather than a transformable property.

Claims 80-82 depend from claim 76 and therefore contain all the limitations of that claim. Claims 80-82 are prima facie not obvious over the cited references, because the references do not describe a system including, among other things, a first substrate having a plurality of interconnection elements, wherein an interconnection element includes a first element material and a second element material, at least one of which comprises a material of a transformable property such that, upon transformation, the shape of the interconnection element is modified. Likewise there is motivation from the cited references, as Smith, the primary reference, teaches a material having a stress gradient, rather than a transformable property, to define the shape of the spring contact.

For the above stated reasons, Applications respectfully request that the Patent Office withdraw the rejection to claims 34, 36, 47, 52-54, 65, 67 and 80-82 under 35 U.S.C. §103(a).

I. 35 U.S.C. 103(a): Rejection of Claim 45

The Patent Office rejects claim 45 under 35 U.S.C. §103(a) as obvious over Smith in view of U.S. Patent No. 5,994,152 issued to Khandros et al. (Khandros). Khandros is cited for disclosing an interposer.

Claim 45 depends from claim 22 and therefore contains all the limitations of that claim. Claim 45 is prima facie not obvious over the cited references because the references do not describe an electronic component including a substrate having a plurality of interconnection element, wherein an interconnection element includes a first element material and a second element material, at least one of which, comprises a material having a transformable property such that, upon transformation, the shape of the interconnection element is modified. Likewise, there is no motivation from the cited references, as Smith, the primary reference, teaches utilizing a stress gradient, rather than a transformable property, to define a shape of a spring contact.

For the above stated reasons, Applicants respectfully request that the Patent Office withdraw the rejection to claim 45 under 35 U.S.C. §103(a).

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

CONCLUSION

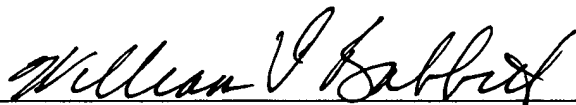
In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly, extension of time fees.

Respectfully submitted,

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Date: July 30, 2001



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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on July 30, 2001.



Azar Burnham

July 30, 2001

Date

Attachment: VERSION WITH MARKINGS TO SHOW CHANGES MADE

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

On page 4, lines 28-29, please replace "08/852,152, titled "Microelectronic Spring Contact Elements", with --08/852,152, filed May 6, 1997 (now U.S. Patent No. 6,184,053), titled "Method of Making Microelectronic Spring Contact Elements--.

IN THE CLAIMS

4. (Amended) The interconnection element of claim 1, wherein the transformable property is such that a first volume of one of the first element material and the second element material is adapted to be transformed to a different second volume.

9. (Amended) The interconnection element of claim 1, wherein at least one of the ~~firsts~~ first element material and the second element material are introduced by plating.

13. (Amended) The interconnection element of claim 4, wherein the first element material is an alloy comprising palladium/cobalt and ~~the~~ an activation layer comprises one of copper and nickel.

23. (Amended) The electronic component of claim 22, further comprising:
a plurality of conductive signal lines associated with the substrate; and
in the plurality of free-standing resilient interconnection elements coupled to the substrate, the base of the interconnection element electrically contacts a corresponding one of the signal lines ~~and an interconnection element~~.

48. (Amended) An assembly comprising:
a first substrate having a plurality of first contact nodes formed on the first substrate and a plurality of free-standing resilient interconnection elements coupled to the first substrate in such a manner that a base of an interconnection element electrically contacts a corresponding one of the first contact nodes; and

a second substrate having a plurality of second contact nodes,
wherein the interconnection element comprises:
a first element material adapted to be coupled to ~~a~~ the first substrate, and
a second element material coupled to the first element material, and one of the first element material and the second element material comprises a material having a transformable property such that upon transformation, a shape of the interconnection element is modified,

wherein the interconnection element has a portion thereof which is capable of moving to a first position in which the interconnection element is in contact with ~~a one of the plurality of~~ second contact ~~node~~nodes.

76. (Amended) A system for contacting an electronic device including an assembly comprising:
a first substrate having a plurality of first contact nodes formed on the first substrate and a plurality of free-standing resilient interconnection elements coupled to the first substrate in such a manner that a base of an interconnection element electrically contacts a corresponding one of the first contact nodes; and

a second substrate having a plurality of second contact nodes,
wherein the interconnection element comprises:

a first element material adapted to be coupled to ~~a the~~ first substrate, and

a second element material coupled to the first element material, and one of the first element material and the second element material comprises a material having a transformable property such that upon transformation, a shape of the interconnection element is modified,

wherein the interconnection element has a portion thereof which is capable of moving to a first position in which the interconnection element is in contact with ~~a one of the plurality of~~ second contact ~~node~~nodes.